

HYPERMEDIA CAI WITH COGNITIVE APPRENTICESHIP FOR PRE-SERVICE TEACHER EDUCATION

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Recent innovations in hypermedia computer technology permit learners to have highly individualized and interactive computerized instruction. However, adapting hypermedia computer technology to computer-assisted instruction (CAI) does not guarantee effective learning. Research studies have revealed that when learners were not fully aware of or responsible for what they needed to learn from CAI, they made poor decisions on their completion levels of learning (Kinzie & Sullivan, 1989; Kinzie, Sullivan, & Berdel, 1992; Steinberg, 1989). Therefore, consideration should be given to designing hypermedia CAI environments with appropriate instructional strategies, which guide learners to acquire necessary knowledge and skills.

Our current computer authoring system technology enables instructional software developers to incorporate special constructivistic instructional strategies such as the cognitive apprenticeship method into sophisticated CAI environments (Lajoie & Lesgold, 1989; Parkes & Self, 1990). Researchers and practitioners of the cognitive apprenticeship teaching method suggest that cognitive knowledge and skills can be effectively learned by "learning-through-guided experience" (Collins, Brown, & Newman, 1989, p.457). The learning-through-guided experience occurs through the sequence of modeling, coaching, fading, and reflecting. A cognitive master (i.e., a teacher or a computerized coaching system) shows the appropriate way of performing learning tasks, and apprentices (i.e., learners) practice the tasks with the strategic hints or scaffolding provided by the master. As the apprentices improve their skills or knowledge, the master gradually withdraws the guidance, and the apprentices take on the responsibility of performing the learning tasks. When completed, the learning responsibilities and the expertise have been shifted from the master to the apprentices. This learning-through-guided experience technique is beneficial when the learning subject is a type of situated problem solving or dilemma handling, which students in pre-service teacher education especially need to practice before they become classroom teachers.

The processes of learning responsibility and expertise shift can be observed by the utilization of self-regulated learning (SRL) skills as well as in academic outcomes of instruction (Schunk, 1989; Zimmerman, 1989, 1994). Accord-

ing to Zimmerman (1989), self-regulated learners are metacognitively, motivationally, and behaviorally active in their learning processes. When constructively taught how to use the SRL skills such as self-monitoring or self-evaluating, novice learners, or ineffective impulsive learners, have been shown to successfully shift themselves from being ineffective, low academic achievers to effective, responsible high academic achievers (Schunk, 1989; Zimmerman & Martinez-Pons, 1990). SRL skills can be taught and learned at any age (Butler & Winne, 1995). The positive effectiveness of SRL skills on learning has been shown in many research studies across a wide range of learners from young children (Pintrich & DeGroot, 1990; Zimmerman & Ringle, 1980) through college-level students or adults (Lan, Repman, Chyung, & Bradley, 1996; Zimmerman & Paulsen, 1995).

An important approach for pre-service teacher education is hypermedia CAI that implements the cognitive apprenticeship method. A hypermedia CAI program incorporating with the cognitive apprenticeship method may monitor an individual's performance, evaluate his or her progress in mastering the content, and provide guidance through learning sequences with strategic hints and scaffolding at appropriate moments. This innovative hypermedia learning environment may enable pre-service teachers to learn in constructivistic ways exploring a rich information world, help them develop and use SRL skills, and increase ownership of the learning process and expertise with the content. This will